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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/692,772	10/24/2003	Laura Wills Mirkarimi	10031180-1	8958

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EXAMINER

VINH, LAN

ART UNIT	PAPER NUMBER
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1765

DATE MAILED: 07/11/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/692,772

Applicant(s)

MIRKARIMI ET AL.

Examiner

Lan Vinh

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 04 May 2006.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-5,8-16, 19 and 20 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 11-16 is/are allowed.
- 6) ☒ Claim(s) 1-5,10,19 and 20 is/are rejected.
- 7) ☒ Claim(s) 8 and 9 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- ☐ Notice of References Cited (PTO-892)
- ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date 32706.
- ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____
- ☐ Notice of Informal Patent Application (PTO-152)
- ☐ Other: _____

DETAILED ACTION

Response to Arguments

1. Applicant's arguments, see pages 6-7 of the response, filed 5/4/2006, with respect to the rejection(s) of Claims 8, 9, 11-18, 19-21 under the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 1-6, 9, 12-17, 20 of copending Application No. 10/765,647 in view of Shul et al (US 5,624,529) have been fully considered and are persuasive. The rejection has been withdrawn.

Applicant's arguments, see page 8 of the response, filed 5/4/2006, with respect to the rejection(s) of claim 8 under 35 U.S.C 103(a) as being unpatentable over Tanabe et al (US 6,893,971) in view of Shul et al (US 5,624,529) have been fully considered and are persuasive. The rejection has been withdrawn

Applicant's arguments, see pages 9-10 of the response, filed 5/4/2006, with respect to the rejection(s) of claims 11-15 under 35 U.S.C 103(a) as being unpatentable over Shul et al (US 5,624,529) in view of Jewell (US 5,03, 344) have been fully considered and are persuasive. The rejection(s) have been withdrawn

Applicant's arguments filed 5/4/2006 with respect to the rejection of claims 1-5 under 35 U.S.C 103(a) over Tanabe and Shul have been fully considered but they are not persuasive. The applicants argue that there is no suggestion to combine the references of Tanabe and Shul because Shul teaches only the flow rates of gases into the reactor, not the concentration within the reactor and since gases are consumed in the reactor, one can not determine the reactor concentrations from the teachings of Shul. This argument is unpersuasive because of the following reasons: Shul teaches the flow rate

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of BCl₃ into the reactor while claim 1 requires "wherein BCl₃ is present in said reactor at a concentration of about 5 percent to about 75 percent by volume". The claim language of "a concentration of about 5 percent to about 75 percent by volume" of the gas in the reactor, can be interpreted as the flow rate of the gas in the reactor. While it is true that gases are consumed in the reactor, it is also true that claim 1 requires "a concentration of BCl₃ about 5 percent to about 75 percent by volume" in the reactor, which also implies that the concentration of the gas varies/being consumed in the reactor. Thus, it is asserted that Shul discloses the concentration of gas, as recited in claim 1, and one skilled in the art at the time the invention was made would have found it obvious to employ Shul teaching in Tanabe method to produce the claimed invention

The applicants argue that there are additional ground for allowing claim 19 because claim 19, which requires a three-gas mixture the Examiner has used the present application as a guide in selecting one of the other gases in the five-gas mixture taught in Shul to add to the gas mixture taught in Tanabe. This argument is unpersuasive because it does not commensurate with the scope of claim 19 since claim 19 requires only a two-gas mixture

The applicants argue that since Shul teaches that the results are highly dependent on a large number of factors including the gas flow rates, temperatures, specific substrate and there are an overwhelming number of variables and combination thereof, one skilled in the art, without teachings of the present application, at the time the invention was made would not arrive at the claimed combination without undue experimentation. This argument is unpersuasive because Demmin establishes/serves as an evidence

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that gas flow rate is a result effective variable (paragraph 4 below) and it has been held that discovering an optimum value of a result effective variable involves only routine skill in the art. See *In re Boesch*, 617 F.2d 272, 205 USPQ 215 (CPA 1980)

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

3. Claims 1-5, 10, 19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tanabe et al (US 6,893,971) in view of Shul et al (US 5,624,529)

Tanabe discloses a dry etching method of an InP-based compound. The method comprises the steps of:

forming a mask on the InP-based substrate/III-V based compound (col 6, lines 1-4)
placing the InP substrate and the mask into a reactor having a pressure of 0.5 Pa/3.7 mTorr (which overlaps the claimed range between 2 mTorr to about 20 mTorr)
(col 8, lines 18-20)

introducing a first gas of HI/a gas chosen from group VII gaseous species into the reactor (col 7, lines 38-40)

introducing a second gas of BCl₃ into the reactor (col 7, lines 36-37)

exposing the InP substrate/the III-V based compound to a gas plasma comprises

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HI and BCl₃ for deep via holes having a sidewalls etching fabrication and then make it possible to control fabrication shape into a desired shape, a mirror finish of the surface can be achieved (col 9, lines 40-65; fig. 7a), which reads on exposing the InP substrate/the III-V based compound to a gas plasma comprises the first and second gas to etch smooth high aspect ratio sidewalls

Unlike the instant claimed inventions as per claims 1, 17, 19, Tanabe fails to disclose that BCl₃ is present in the reactor at a concentration of about 5 to about 75% by volume

Shul discloses a dry etching method for compound semiconductors comprises the step of exposing the portion of the III-V semiconductor material to the etching mixture comprises BCl₃, CH₄ and H₂ wherein the concentration of BCl₃ is 11 % by volume (col 6, lines 42-47)

One skilled in the art at the time the invention was made would have found it obvious to modify Tanabe method by using the specific concentration of BCl₃ as per Shul because Shul discloses that for etching indium containing material, a preferred plasma composition is about 5 sccm BCl₃/ 11 % volume of BCl₃ in the total volume of the etching gas mixture (col 42-45)

The limitation of claim 2 has been discussed above

Regarding claim 3, Tanabe discloses using dry etching/RIE etching (col 4, lines 19-22)

Regarding claim 4, Tanabe discloses generating the plasma using high-frequency power and inductively coupling plasma (col1, lines 10-13)

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Regarding claim 5, Tanabe discloses using a RF generator to provide power at 100-150 watts and a high frequency power at 700-900 Watts (col 10, lines 10-15)

Unlike the instant claimed invention as per claim 8, Tanabe fails to disclose introducing CH₄ and H₂ into the reactor. Shul also discloses exposing the portion of the III-V semiconductor material to the etching mixture comprises BCl₃, CH₄ and H₂. One skilled in the art at the time the invention was made would have found it obvious to modify Tanabe by introducing CH₄ and H₂ into the reactor as per Shul because Shul discloses that for etching indium containing material, a preferred plasma composition includes BCl₃, CH₄ and H₂ (col 6, lines 43-46)

Regarding claim 10, Tanabe discloses adjusting the temperature of the InP substrate to 50-150° C (col 3, lines 42-43)

4. Claim 20 is rejected under 35 U.S.C. 103(a) as being unpatentable over Shul et al (US 5,624,529) in view of Demmin et al (US 6,635,185)

Shul discloses a dry etching method for compound. The method comprises the steps of:

forming a mask 16 on the III-V based compound (AlInP) (col 4, lines 9-10, col 6, lines 33-35; fig. 1)

placing the III-V compound and the mask into a reactor having a pressure of 0.5 – 20 mTorr (which overlaps the claimed range between 2 mTorr to about 20 mTorr) (col 6, lines 9-10)

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introducing a first gas of BCl₃ , CH₄/second gas and H₂/third gas into the reactor
(col 6, lines 21-23)

exposing the III-V based compound to a gas plasma comprises the gases/etchants
for to etch smooth high aspect ratio sidewalls (col 6, lines 42-54; fig. 1)

Unlike the instant claimed invention as per claim 20, Shul fails to disclose the
specific concentration /ratio of the second and third gas although Shul discloses that the
relative flow rate/concentration of the gases are important in controlling the etch rate
(col 6, lines 25-27)

Demmin, in a method for etching semiconductor substrate, discloses that a
parameter such as the gas flow rate may vary and effect on the result obtained (col 7,
lines 15-20). Demmin serves as an evidence that gas flow rate is a result effective
variable

Hence, one skilled in the art at the time the invention was made would have found it
obvious to vary/adjust the concentration of the second and third gas in Shul etching gas
mixture in view of Demmin teaching because Demmin discloses that one skilled in the
art of plasma etching can vary the flow rate/parameter accordingly to etch a desired
material satisfactorily (col 7, lines 23-25). Also, it has been held that discovering an
optimum value of a result effective variable involves only routine skill in the art. See *In re Boesch*. 617. F2d 272, 205 USPQ 215 (CPA 1980)

Allowable Subject Matter

5. Claims 11-16 allowed.

The following is an examiner's statement of reasons for allowance:

Regarding claim 11, the applicants have presented a persuasive argument, see page 10 of the response filed on 5/4/2006 that a change of either HBr or I₂ for the chlorine in a two-gas system, as taught by Jewell, would not be advantageous in the Shul reference etchant system that requires five-gases system. Thus, the rejection(s) of claims 11-15 under 35 U.S.C 103(a) as being unpatentable over Shul et al (US 5,624,529) in view of Jewell (US 5,03, 344) have been withdrawn

Claims 8-9 objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims. The reasons for the indication of allowable subject matter of claim 8 has been discussed above in paragraph 1

6. THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

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Conclusion

7. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Lan Vinh whose telephone number is 571 272 1471.

The examiner can normally be reached on M-F 8:30-5:30 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nadine Norton can be reached on 571 272 1465. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



LV
June 30, 2006